REMARKS

This responds to the Office Action mailed on July 31, 2007.

Claim 23 is amended, claims 1-22, and 30-78 are canceled; as a result, claims 23-25, 27-29 and 79 are now pending in this application.

The Objection to the Drawings

The Office Action objected to the drawings based on a failure to show the "plurality of non-conductive spacers (e.g., see claims 27 and 70)." Applicants believe the reference to claim "70" was intended to be claim 79, under examination, as claim 70 has been withdrawn from examination (and has now been cancelled).

Applicants believe this matter has been previously addressed by the amendment of Figure 4, and the accompanying amendment to the specification, as submitted in the Amendment in response to the Office Action of November 22, 2005, filed by Express Mail on March 22, 2006. Although those amendments were objected to in the following Office Action, dated July 14, 2006; those objections were expressly withdrawn in the subsequent Office Action, dated April 6, 2007. Accordingly, Applicants believe that the basis for this objection has been previously cured. If Applicants have misunderstood this objection, however, they request clarification of the nature of the objection, and will make every effort to address it to the Examiner's satisfaction in a supplemental response.

Rejection of Claims 23-25, 28 and 29 Under §102 and §103

Claims 23-25, 28 and 29 were rejected under 35 U.S.C. § 102(b) for anticipation by Aramaki et al. (U.S. 7,193,237); and as being obvious in view of the same reference. Relative to base claim 23, Aramaki was relied upon to teach a diode device with a semiconductor layer 13 of porphyrin compound that is sandwiched between two electrodes (citing Fig 3E and col. 32, lines 32+); wherein that porphyrin compound can be an organic semiconductor in a liquid crystal state (citing col. 13, lines 65+). Additionally, relative to the claim limitation of "wherein said liquid semiconductor contains a radioactive isotope in solution," Aramaki was relied upon to teach a

liquid organic compound that "inherently includes carbon containing a naturally-occurring radioisotope, i.e.. carbon-14." For the reasons set forth below, Applicants respectfully submit that Aramaki cannot be fairly relied up for these teachings relative to Applicants' claims, and that the pending claims patentably distinguish over Aramaki.

Applicants first wish to address the current amendment to claim 23. Claim 23 has been amended in the preamble to recite a nuclear voltaic cell "configured to produce an electrical current." This limitation is not one of intended use, but is a recitation that the nuclear voltaic cell is of a structure/configuration that can generate an electrical current. As will be addressed in more detail below, whatever Aramaki discloses, it does not disclose or in any way suggest any device with a structure configured to generate an electrical current.

Aramaki discloses a wide variety of "electronic devices" which are represented to benefit from the described organic semiconductors. The reference indicates that such electronic devices may be "a device having at least two electrodes and designed to control the electric current flowing between the electrodes or the resulting voltage by other than light, for example by electricity, magnetism or chemical substance."[1] Specific examples of such devices are discussed, including field effect transistors,[2] static induction transistors,[3] diode devices,[4] and resistance elements[5]; with examples of such devices being used as the switching device of an active matrix display,[6] or an integrated circuit (including a logic circuit, an oscillation device, or an amplification device),[7] or as a sensor.[8] All of these devices, however, would be ones which would have power supplied to it, and none would be configured to produce an electrical current. In fact any generation of electrical current by these devices would defeat the purpose of the devices as disclosed by Aramaki. Applicants submit that for these reasons alone, Aramaki fails

[1] *See* Aramaki, col. 28, lines 41-67.
[2] *See* Aramaki, col. 29, line 41-col. 31, line 31.
[3] *See* Aramaki, col. 31, line 32-col. 32, line 31.
[4] *See* Aramaki, col. 32, line 32-col. 33, line 3.
[5] *See* Aramaki, col. 33, line 5-col. 33, line 24.
[6] *See* Aramaki, col. 33, lines 29-52.
[7] *See* Aramaki, col. 33, lines 54-59.
[8] *See* Aramaki, col. 33, line 61-col. 34, line 2.

to anticipate or render obvious, claim 23 as amended, or any of the remaining claims dependent therefrom.

Notwithstanding the belief that the basis for the rejection under §102 over Aramaki has been overcome, Applicants will further address the reference. The primary focus of Aramaki is the use of a wide variety of porphyrin compounds as organic semiconductors. Aramaki is clear that the preferred compound is one wherein the distance from the porphyrin ring structure to the center of each atom forming the porphyrin skeleton is not more than 1 angstrom.[9] Additionally, in the preferred compound an atom or atomic group is bonded to certain specified substituents and are restrained from free rotation at room temperature.[10] This restraint from free rotation is indicative of a desire that the porphyrin compound be a solid, as such free rotation as described would be inherent in a liquid material.

Aramaki repeatedly addresses two basic formulae "(1)" and "(2)" as the preferred porphyrin skeletons of the invention.[11] In describing these two generalized skeletons, Aramaki identifies two substituents (Z^{ia} and Z^{ib}) that each represent a monovalent organic group, and identifies at least 18 different possibilities for each group.[12] Aramaki then identifies that where the above substituents are bonded to form a ring, the organic group may be selected from at least 10 different possibilities.[13] In columns 14-25, Aramaki discloses 38 different examples of "generalized porphyrin compounds" in accordance with the asserted invention. Even with these 38 generalized compounds, however, Aramaki is clear that in addition to those examples, other examples with metal salts could be used; as well as other permutations, including asymmetrical structures.[14] Thus, Aramaki identifies a huge number of possible compounds.

The primary passage addressing liquid crystal porphyrin is that cited in the rejection.[15] In that passage Aramaki reiterates that the preferred porphyrin skeleton is in a solid state at room

[9] *See* Aramaki, col., 11, lines 55-67; col., 5, lines 56-61.
[10] *Id.; see also* Aramaki, col., 5, line 56-col. 6, line 15.
[11] *See* Aramaki, col. 10, line 47-col. 12, line 16.
[12] *See* Aramaki, col. 11, lines 19-29.
[13] *See* Aramaki, col. 11, lines 29-37.
[14] *See* Aramaki, col. 14, lines 20-31.
[15] *See* Aramaki, col. 13, line 62- col. 63, line 19.

temperature.[16] Such preferred compounds are obviously not in a liquid state. Aramaki then goes on to make the conclusory statement that "[d]epending upon the substituent in the formula (1) or (2), a compound showing a liquid crystal property can be obtained, and it can be used as an organic semiconductor even in a liquid crystal state." However, out of all the permutations of substituents Aramaki identifies, the reference does not indicate a single substituent that could be used to yield a compound with a liquid crystal state, much less to yield one with a liquid crystal state and that would have semiconductive properties in that state.

Other than the referenced passage in columns 13 and 14, there is no other substantive disclosure in Aramaki of any of the disclosed porphyrin compounds in a liquid crystal state; much less of such a compound having semiconductive properties in that state. There are only three additional mentions of "liquid crystal" in Aramaki. In column 33, Aramaki identifies that the disclosed devices may be used as the switching device of an active matrix display, one type of which may be a "polymer-dispersed type liquid crystal display device."[17] It is significant to note that the porphyrin compound is not the liquid crystal element, but is the switching device (transistor) in the active matrix display. In column 36, Aramaki identifies a method of forming an organic semiconductor film. The sentence is unclear, but appears intended to merely identify a deposition process similar to one used for liquid crystal films: "[f]urther, as a technique similar to the coating, a Langmuir Blodgett method wherein a monomolecular film formed on a water surface is transferred to and laminated on a substrate, or a method of interposing liquid crystal or molten liquid between a pair of substrates or introducing it between the substrates by a capillary phenomenon, may, for example, be mentioned."[18] And the final mention is in Column 52, where Aramaki again discusses the use of a disclosed "electronic device" as the switching transistor of a flexible active matrix liquid crystal display.[19]

Aramaki's further statements make clear that the conclusory statement of an organic semiconductor in a liquid crystal state is entirely speculative. Aramaki states in column 14,

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[16] *See* Aramaki, col. 13, lines 62-65.
[17] *See* Aramaki, col. 33, lines 29-42.
[18] *See* Aramaki, col. 35, line 52-4 col. 36, line 3.
[19] *See* Aramaki, col. 52, lines 53-61.

"[e]specially, the generalized porphyrin compound of the present invention has a structure having a good planar nature, whereby it is expected that a discotic liquid crystal may be obtained, and such a structure is suitable for transport of a carrier." Thus, the stated results are not actual, but are speculative at best, and there is no stated justification for the "expected" properties, either of a liquid crystal state, or of suitable carrier transport properties. Applicants respectfully submit that Aramaki's statements of "expected" properties, with no identified basis for the supposed expectation; and with no identification of which (if any) of the plethora of identified permutations of porphyrin compounds might yield those purported properties, represents no more than an "invitation to experiment" for others. Thus, Applicants submit that Aramaki does not contain an enabling disclosure of any porphyrin compound that serves as an organic semiconductor in a liquid crystal state.

As the Examiner is aware, the generally-stated premise is that issued U.S. patents are presumed to be enabling. This premise has been stated repeatedly by the Board of Patent Appeals and Interferences ("Board"). But the Board has also made clear that this presumption is based on the presumption of validity of the patent claims under 35 U.S.C. §282:

> If, by that argument, appellants would cast aspersions on the [prior art] patent or imply that the patent is non-enabling or otherwise discredit its qualifications as a reference, we disagree. As stated in 35 USC 282, a patent shall be presumed valid and each claim of a patent shall be presumed valid independently of the other claims. Here, the [prior art] patent is presumed valid and each claim is likewise presumed valid...*Considering that presumption of validity, we presume that [the patent] claims are based on a fully enabling disclosure as required by 35 USC 112, first paragraph.*[20]

Thus, the presumption attaches because the claims of the patent are presumed valid; and the specification that supports those claims is therefore presumed to be enabling under §112. Based on the Board's analysis, because Aramaki never claims a liquid crystal compound, the disclosure of Aramaki is not entitled to any presumption of enablement on that unclaimed subject matter. Specifically, Aramaki does not claim either (i) a compound in a liquid crystal state, or (ii) a compound that is an organic semiconductor in a liquid crystal state, in any of: (1) the

[20] *Ex parte Goldgaber*, 41 USPQ 2d 1172, 1175 (B.P.A.I. 1996) (emphasis added) *citing In re Lamberti*, 545 F2d 747, 751 n.2, 192 USPQ 278, 281 n.2 (C.C.P.A. 1976).

Aramaki application as originally filed; (2) Aramaki as issued; or (3) the currently-pending continuation of Aramaki.[21] There has thus been no reason for the PTO to even consider the enablement of that subject matter, much less to pass judgment that such subject matter is enabled. Therefore, under the Board's reasoning above, there is no basis for a presumption that Aramaki's cursory and speculative disclosure enables the unclaimed subject matter of a porphyrin compound that either (i) exists in a liquid crystal state, or (ii) is an organic semiconductor in a liquid crystal state.

Applicants will next address the presence of the carbon-14 in the structure of Aramaki. Claim 23 recites "wherein said liquid semiconductor contains a radioactive isotope in solution." Thus, the recited structure requires that there be both a liquid semiconductor and a radioactive isotope; and that the radioactive isotope be in solution in the liquid semiconductor. As noted above, Applicants do not believe that Aramaki provides the required teaching of a liquid semiconductor. However, even if we assume-- purely for purposes of argument-- that Aramaki does disclose a compound that would be an organic semiconductor in a liquid state, the carbon, including the carbon-14, identified in the rejection, is an essential constituent of that liquid state organic semiconductor; and without the carbon, no such compound, and thus no organic semiconductor would exist. Thus, the hypothesized liquid semiconductor cannot exist separate from the recited carbon; and so at best, only one component of the claimed combination is present. Accordingly, even under the most generous assumptions, Aramaki still fails to disclose a liquid semiconductor that contains a radioactive isotope in solution, as claimed by Applicants.

Applicants also wish to note that although some trace amount of carbon-14 might be inherent in the organic semiconductor of Aramaki, one skilled in the art would recognize the presence of a radioactive isotope as something to be avoided in the Aramaki structures to the extent possible. As is known to those skilled in the pertinent arts, any ionizing radiation from the carbon-14 present could only be detrimental to the complex porphyrin structures of Aramaki, tending to break the structural bonds and thus decomposing the compounds. Thus, the trace amount of carbon-14 present in the carbon component of the porphyrin compound (estimated by

[21] Serial no. 11/671,085; filed 2/5/2007; published 6/28/2007.

some sources to be as low as 1 part per trillion of the carbon on the planet), is a detrimental and undesirable component; and can be acceptable in Aramaki only to the extent that it is present in a sufficiently minimal trace amount that the damage it would cause is at an acceptable level.

The Office Action draws parallels between the function of the devices of Aramaki and Applicants' claimed invention. The Office action does this on pages 4 and 5: (1) "[a]s to applicant's claimed nuclear voltaic cell, the structure and method of operation of Aramaki et al. is the same as that recited in the claims, and Aramaki et al. must inherently function in the same manner to produce the same results as applicant's situation"[22] and (2) "[t]he cited reference is capable of being used in the same manner and for the intended or desired use as the claimed invention."[23]

While there clearly may be some situations in which similarly-structured apparatus will inherently have similar functions or uses, Applicants respectfully submit that such an all-encompassing generalization cannot be made; and that such a conclusion is clearly inaccurate and inappropriate in regard to these claims and this prior art. For example, Applicants' claims are drawn to a "nuclear voltaic cell" that is clearly identified in the specification to be a source of electrical current. That has been now emphasized in the claims by the recitation of structure in the claim that the "nuclear voltaic cell is configured to generate an electrical current." In contrast, as discussed above, Aramaki discloses devices for uses as transistors, diodes and resistance elements. As but one example, it is apparent that if a device intended to function as a switching transistor or a diode were to generate electrical current rather than gating it, the intended function would be severely impaired-- if not lost completely.

The disparity in functions between Aramaki's disclosed devices and Applicants' claimed devices discussed above, supports both the inapplicability of the broad generalization in the Office Action and the significance of the above-identified structural differences between Aramaki and Applicants' claimed structure. To illustrate this, let us assume that Aramaki is

[22] Office Action, page 4.
[23] Office Action, page 5.

enabling for the subject matter that it does actually claim, which includes "switching devices" (claims 10 and 19), "field effect transistors" (claim 11 and 20), etc. However, as noted above, the functionality of those devices would be impaired or lost if the devices were generating current. Therefore, if Aramaki does enable such devices (as it is presumed to do--since they are claimed), then a similarity in structure does not necessarily yield a similarity in function or use; and/or the structures must in fact be different (for all the reasons set forth above by Applicants).

Accordingly, Applicants respectfully submit that for all the reasons above, Aramaki fails to disclose, or to in any way suggest, the nuclear voltaic cell as claimed in claims 23-25, 28 and 29; and thus that such claims are allowable over the reference. Applicants therefore request the reconsideration of the rejections of these claims under §§ 102 and 103, and the passing of these claims to issue.

The Rejection of the Claims 27 and 29 Under §103

Claims 27 and 79 were rejected under 35 U.S.C. § 103(a) as being unpatentable over Aramaki et al., on two bases, including that the use of non-conductive spacers between the first and second metal contact layers is a "matter of design choice or optimization within prior art conditions or through routine experimentation." Applicants believe that base claim 23 has been shown to be allowable for the reasons set forth above, and that these claims are allowable at least on that basis.

Applicants do wish to identify, however, that Aramaki does not actually disclose any structure using a liquid. All structures of figures 1-3 are apparently depicted as solids, and there is no indication that the described field effect transistor, static induction transistor or diode devices are anything but solids. For example, the field effect transistor is said to be able to be formed having a "thin film" and thus being flexible, and thus to be useful as the switching device for an active matrix liquid crystal display, such that a flexible display can be made.[24] But Applicants submit that disclosure of such a thin film device does not in any way imply the use of a liquid to those skilled in the semiconductor device manufacturing arts.

[24] *See* Aramaki, col. 29, lines 16-26.

As a result, Applicants submit that the failure of Aramaki to identify any structure using a liquid semiconductor has the result that design modifications or refinements to structures using liquid semiconductors, as identified in the Office Action, are not obvious matters of design choice based on the reference. In any event, however, Applicants believe that the these claims have been shown to be otherwise allowable; and Applicants respectfully request reconsideration of the rejection of these claims under §103.

CONCLUSION

Applicant respectfully submits that the claims are in condition for allowance and notification to that effect is earnestly requested. If there are any matters that may be resolved or clarified through telephone interview, the Examiner is respectfully requested to telephone Applicant's undersigned attorney at (512) 628-9324.

If necessary, please charge any additional fees or credit any overpayments to Deposit Account No. 19-0743.

Respectfully submitted,

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